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The Informal Sector, Firm Dynamics, and Institutional Participation

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The high informality and mortality and apparent stagnation of developing country microfirms are often thought to result from government-induced distortions in labor or product markets. A new approach assumes that these informal firms have dynamics similar to firms in industrial countries, and that formality can be thought of as the decision to participate in societal institutions. This leads to a substantially different vision of the relationship between formality and the nature of the small firm that emphasizes the informal firm first as a normal enterprise and second as informal.

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Summary findings

The informal microfirm sector is believed to be large, accounting for 20–40 percent of employment in many developing countries. The literature tends to view the sector as the disadvantaged sector of a segmented labor market, as existing to evade government regulations, or as constrained by lack of access to government services.

Levenson and Maloney offer a unique theoretical framework to analyze informality and microfirm growth behavior — one that emphasizes the entrepreneurial nature of informal firms and sees informality as a secondary characteristic.

First, they assume that informal firms in developing countries have dynamics similar to firms in industrial countries: entrepreneurs have unobserved, differing cost structures that determine their long-run size and survival — structures that they can only discover by going into business.

Second, informality can be thought of as a decision to participate in societal institutions. Access to mechanisms that ensure property rights, pool risk, or enforce contracts become more important as a firm grows, and the entrepreneur will be willing to pay for them through "taxes" in a way that was not the case as a small firm.

The combination of these assumptions generates several of the stylized facts emerging from cross-sectional data and identified in existing models — informal firms tend to remain small and have high rates of mortality, and lower productivity — without recourse to government-induced distortions in labor or product markets. Further, the framework predicts that firms whose cost structures dictate that they should expand will make the transition to formality as they grow.

Using detailed observations from Mexico, Levenson and Maloney find their view consistent with patterns of formality and growth of microfirms.

This paper — a product of the Poverty Reduction and Economic Management Sector Unit, Latin America and the Caribbean Region — is part of a larger effort in the region to understand the structure of labor markets in developing countries. Copies of the paper are available free from the World Bank, 1818 H Street NW, Washington, DC 20433. Please contact Tania Gomez, room I8-102, telephone 202-473-2127, fax 202-522-2119, Internet address tgomez@worldbank.org. William Maloney may be contacted at wmaloney@worldbank.org. September 1998. (31 pages)

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The Informal Sector, Firm Dynamics and Institutional Participation

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I. Introduction

Crude estimates suggest that the informal production sector is large, accounting for 20 to 50 percent of employment in many developing countries (Portes, 1994). Yet progress towards consensus on the sector's origins, operations and even definition has been hampered by two problems.[1] First, the lack of comprehensive data has prevented accurately establishing the basic characteristics of informal production beyond conjecture and casual observation. Second, whereas the literature on informal finance -- *i.e.* unregulated financial intermediation -- has a broad theoretical underpinning,[2] the literature on informal production tends toward ad hoc characterizations and lacks a comparably broad foundation.[3] In general, these frameworks rely on an institutional distortion such as a binding minimum wage, evasion of government regulation and taxation, or differences between firms in worker monitoring ability to generate the informal sector.[4]

This paper makes two contributions. First, it offers systematically collected data on a broad cross-section of urban firms in Mexico with details on compliance with or participation in a number of different societal institutions. The data are derived from a nationally representative sample of all such firms, a significant improvement over pre-existing case study data sets. We are thus able to move beyond anecdotal analysis and establish some definitive stylized facts about informal production for the first time.

Second, it offers a theoretical framework to motivate the analysis of the data. The

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[1] A large body of literature equates informality with the low-wage, low-productivity segment of a dual labor market (for example, Lewis, 1954, and Harris and Todaro, 1970). An equally sizeable literature equates informality with unregulated self-employment (for example, Hart, 1972, and de Soto, 1989). See Thomas (1992) and Portes (1994) for excellent overviews. Our approach in this paper equates informality and noncompliance with societal norms such as tax obligations, labor protections, census enumerations, business guild participation, *etc.* In line with both Thomas' and Portes' characterizations, we are concerned with unregulated/unmonitored activities that are ostensibly legal, not those that are truly illegal (criminal).

[2] See Besley (1995) for an excellent overview.

[3] See Thomas (1992) and Portes (1994). Exceptions include Esfahani and Salehi-Isfahani (1989), Rauch (1991), Loayza (1995), and Banerji and Jain (1996).

[4] For the remainder of the paper we will use "informal" exclusively to characterize the production and distribution of goods processes.

approach is unique because it assumes that informal firms behave no differently from small firms in industrialized counties and that no institutional or governmental distortions are required to generate their behavior. To this end the analysis builds on recent mainstream empirical and theoretical research on firm dynamics and extends it to incorporate a general concept of formality. The traditional view of tax and regulatory compliance is that government enforcement is the sole determinant.[5] In contrast, we argue that voluntary compliance may arise because the firm derives either direct or complementary benefits from participating in a particular societal institution.

Several appealing results emerge. First, the framework is able to generate many of the cross-sectional patterns of firm and worker behavior addressed by existing models and those found in our data. Second, previous approaches have been static: firms are either formal or informal and none transition in equilibrium. However, empirical evidence suggests that developing country (LDC) firms share some of the evolutionary dynamics of their industrialized country counterparts. We show that these dynamics may be important when analyzing informality because they can generate firm characteristics commonly associated with the formality-informality comparison. Moreover, such dynamics imply equilibrium transitions from informality to formality. The nature of the data employed does not permit following individual firms over time and hence precludes rigorous testing of the dynamic predictions. However, we add a new dimension to the theoretical literature and the predicted cross sectional patterns are supported empirically. Finally, the framework can nest many of the existing conceptions of informality, including models that generate the sector through governmental or institutional distortions.

I. Formality as participation in civic institutions

Different contributions in the literature view compliance with or participation in the institutions of society in seemingly inconsistent ways. Some emphasize firms' desires to evade taxes, regulations or other state controls (for example, Loayza, 1995). Others see the inability to

[5] For example see Ashenfelter and Smith (1979), Fenn and Veljanovski (1988), Cowell (1990).

access institutions, such as those securing property rights, as hampering firm growth (for example, de Soto, 1989). Further there tends to be an assumption that formality is an all or nothing state. We argue that these views are valid only as special cases of a more general and continuous relation between the firm and society.

We recast the question of formality as the firm's decision of how much to participate in the numerous institutions of civil society: federal and local treasuries, governmental programs such as social security (including pensions and health care), the legal system, the banking system, health inspection, firm censuses, trade organizations, civic organizations, *etc.* We argue that a minimal degree of participation in some institutions is a necessary input to growth for many firms, and that participation increases with the success of the business. That is, formality can be viewed as a normal input to production:

$$q = f(L,K,P),$$

where L is labor, K is capital, and P is participation in (a number of different) societal institutions, and all three inputs are complementary. The benefits of formality, while often overlooked, are numerous. They include, but are not limited to:[6]

1. *Enforceable/impersonal contracts and credible signaling.* All entrepreneurs have access to social relationships to enforce implicit contracts among their friends and family, who form a small number of their potential customers and employees. Participation in the legal system is needlessly expensive for transactions with these individuals. Similarly, old age and health insurance may be easily handled by insuring through their mutual extended network of friends and family. Property rights secured by personal ties may be sufficient if investment is minimal. These characteristics of small scale economic transactions are commonly observed in developing countries, as well as in many ethnic enclaves in developed countries. But this mode of operation is constrained by the ability of the entrepreneur to maintain personal relations with all involved parties, a task increasingly unmanageable as firms expand. Legally recognized, enforceable contracts lend credibility to arrangements, permit entry into long term commitments, diminish risk, and can reduce monitoring costs. For example, in a world of imperfect

[6] See also de Soto (1989).

information, certification that the firm complies with government health and safety codes may be necessary for firms to attract the largest customer base possible.[7] Larger investments require that property rights be secured through the legal system.

2. *Access to capital.* Informal capital markets (Besley, 1995) may be sufficient to fulfill the firm's external financing needs at low levels of production. However, the small scale and undiversified nature of informal capital markets makes them unsuitable for satisfying the firm's financing needs at larger scales of operation. Growing firms will turn to formal financial intermediaries such as banks.

3. *Access to public risk-pooling mechanisms.* In order to attract good quality workers the firm may have to offer fringe benefits such as workers compensation, health/unemployment/ disability insurance, and pensions. However, uncertainty over the expected costs of these benefits is high for risk pools with limited numbers of participants, *i.e.* small firms. Indeed, there is evidence that United States firms backed the introduction of a workers' compensation system to decrease the risk of self-insuring against individual claims (Fishback and Kantor, 1996). Hence, even in the absence of mandatory enrollment laws, a firm may want to enroll in government programs that pool risks over a larger population than its own employees.

In exchange for this participation, society imposes "taxes" such as reporting requirements,[8] fiscal obligations, or social insurance payments. We can conceive of these as comprising an initial fixed cost p_0 that may include information or initial registration costs such as those documented by de Soto (1989), and per period costs, p_t, such as taxation that we assume

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[7] While we frame the empirical discussion in terms of formal versus informal *firms*, the concept of informality also applies to subsets of *transactions* that an ostensibly formal firm may undertake. For example, Palay (1984, 1985) shows that certain transactions between rail-freight shippers and their clients in the United States can be characterized as informal because they occur outside the bounds defined by regulation, and hence are legally unenforceable. In keeping with our motivation here, we would expect such informal transactions to take place primarily between two parties that have a long-standing relationship, even if both parties are large firms and not individual people. A different perspective is offered by Portes (1994) who notes that a portion of economic activity at officially-sanctioned firms often goes unreported; that portion of transactions should be considered informal.

[8] This is particularly relevant for bank financing. The firm may have to become registered when it seeks such financing: the government may require the bank to report the identity of all its loan recipients for tax or other purposes.

for simplicity are the same for all firms.[9] We initially assume that the market for formality is voluntary (society levies no costs on firms that choose not to participate in an institution) and that non-payers are perfectly excluded (no free riders). While extreme, these assumptions are consistent with voluntary health or social security programs, and business associations. For example, Chile's self-employed are offered the choice of whether to participate in the state social security program (The Economist, 1996).

Just as importantly, our approach highlights an important effect that is not considered by the standard approach in the literatures on tax evasion and regulatory compliance (for example, Cowell, 1990, Fenn and Veljanovski, 1988). These assume that enforcement is the only determinant of compliance because no private benefit is derived from participation: the institution is treated as a strict public good. However, there may be private benefits that make compliance in many public institutions voluntary. In the mandatory workers' compensation system example cited above, the private benefit of participation outweighed the private cost for many, if not all, firms. De Soto claimed that Peruvian sidewalk vendors sought, not to avoid but, to pay taxes as a way to establish property rights over their precarious business locations. In reality, though the direct private benefit from paying taxes may be zero (again, assuming no enforcement penalties), there may be ancillary benefits that make compliance worthwhile.[10]

This very stylized concept of participation can now be embedded in a model of firm dynamics that has become popular in the industrial organization literature.[11] A number of the existing models of the informal sector (*e.g.* Rauch, 1991) are motivated by Lucas' (1978) model

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[9] p_t could increase with firm size, *i.e.* $p_t = \tau(q) \bullet q$. So long as $d\tau/dq < 0$, the basic conclusions about participation and firm size and age would not change.

[10] Even in cases where the private benefit of participation does not exceed the private cost, the *net* private cost may differ substantially, leading to different probabilities of compliance conditional on a given level of enforcement resources. For example, it may be quite difficult for a firm to undo the effects of a binding minimum wage if the compensation package does not include fringe benefits that can be reduced when the wage is raised. In contrast, it may be easier for the firm to comply with mandated health, pension or other benefits programs by adjusting the wage without significantly altering labor input (for example, Gruber, 1994). Our general point is that the probability of compliance is a positive function of the relative private benefit of participation (net of private costs).

[11] See also Lippman and Rumelt (1982) and Ericson and Pakes (1995).

of the size distribution of firms. Lucas argued that there is a distribution of entrepreneurial ability in the population: Those with a sufficiently high level of proficiency become entrepreneurs, while the rest become wage workers. Among the entrepreneurs, those who are more proficient have firms that are larger and/or more successful. However, the model is static: firms do not grow or fail, nor are they born; no one transitions between wage work and self-employment in equilibrium.

Jovanovic (1982) addressed these limitations by further assuming that entrepreneurs have uncertainty over their firms' true costs of production: Their precise entrepreneurial ability initially is unknown and can only be learned gradually over time by actually operating a business. Potential entrepreneurs' idiosyncratic entrepreneurial ability, θ, affects their costs, $c(q_t)x_t$, through a multiplier $x_t(\theta+\varepsilon_t)$, where $c(q)$ is convex,[12] q is output, and ε_t are random firm specific shocks that prevent certain knowledge of θ. Entrepreneurs make their best guess of x_t^e (the expectation of x_t conditional on information received prior to time t), pay a one time fixed cost of entry, and thereafter choose a level of output q_t to maximize expected profits:

$$\max_{q_t} [P_t q_t - c(q_t)x_t^e] \tag{1}$$

where P_t is the (price-taking) firms' output price. Each period firms get new information on their cost structure from the level of profits. Firms that realize profits above their expected level revise downward their estimate, x_t^e, because

$$\pi_t - \pi_t^e = -c(q_t)(x_t - x_t^e) \tag{2}$$

This yields two important predictions. First, Jovanovic showed from equation (1) that

$$\frac{\delta q_t}{\delta x_t^e} = -\frac{c'}{x_t^e c''} < 0 \tag{3}$$

[12] That is, $c'(q)>0$, $c''(q)>0$, $c(0)=0$, $c'(0)=0$.

which, given the properties of the cost function, implies that a lower cost multiplier raises the level of output. Thus, longstanding firms differ in size because some firms discover that they are more efficient than others. Since participation is a normal input in the production process, the distribution of formality among established firms reflects the underlying distribution of θ.

Second, this learning process broadly defines firms' trajectories of growth and formality over time. Unexpectedly good information on profits leads to a downward revision in x^e_{t+1} and a rise in q_{t+1} above q_t; *i.e.* the firm grows. It also permits more precise estimates of θ, making viable firms more confident that they will survive. Both elements influence the choice of the degree of participation: A firm will choose to become formal if the discounted benefit net of p_t across the expected lifetime of the firm exceeds the fixed costs, p_0.

Figure 1 presents three highly stylized alternate firm trajectories.[13] A new small firm that realizes profits that suggest a high x^e_{t+1} will stop growing at a relatively small size. These "Type 2" firms -- the small survivors -- include businesses such as corner grocery stores, push cart vendors, and door-to-door sales operations with relatively high θ. Given the relatively low benefits of formality for small firms, the expected discounted present value of participation may not exceed p_0 until the firm is very confident about its long run viability, if ever.

In contrast, a firm realizing large unexpected profits will sharply revise downward its x^e_{t+1} and set q_{t+1} much higher than q_t. These "Type 1" businesses in Figure 1 -- the large survivors -- also start small but rapidly expand to a large long-run size. Examples of this type of firm are medium- to large-scale manufacturing plants and wholesale trade warehouses.

Finally, Type 3 firms are the false starters that quickly learn that they are unprofitable, and fail.[14] The population of young firms contains a disproportionate number of such firms that have not yet received enough signals on θ to figure out that they are not viable. The combination of their small size and uncertainty about being able to recoup p_0 over their expected lifetime makes them unlikely to choose to become formal.

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[13] Those shown in Figure 1 are for illustrative purposes and do not exhaust the range of possible firm types.

[14] Jovanovic showed that there exists a maximum level of the cost multiplier, or "failure bound," x^*_{t+1}: firms that realize $x^e_{t+1} > x^*_{t+1}$ shut down..

Figure 2 presents these relations in a very stylized fashion. It shows alternate expansion paths -- with and without participation in a societal institution -- for the types of firm from Figure 1. The expansion paths with participation are net of the variable costs of participating, p_t, and have been drawn so that the percentage increase in revenue is approximately the same for firm types 1 and 2. Comparable proportionate increases in net revenue for small and large firms is a reasonable assumption given that participation is a complement to the other inputs to production. However, as explained below, it is not crucial for the key conclusions to be drawn from the analysis.

One feature of the Jovanovic model is that there is a common failure bound for all firms in an industry, a size below which no firm can profitably operate. Large firms are farther from the failure bound, so they have a higher survival probability. This translates into a longer expected lifetime at any given age. Suppose D is the length of expected firm life -- measured from the current period forward, not from the date of firm formation -- at which the discounted present value of the net benefits of formality (net of p_t) exactly equals p_0. Those firms with expected lifetimes greater than D -- the larger firms -- would choose to participate at an early age, *e.g.* T_1; the smaller firms with shorter expected lifetimes would defer until a later age, *e.g.* T_2. Realistically, as shown in Figure 2, the benefits of participation are likely to be greater for larger firms. This simply accentuates the positive relationship between size and participation: larger firms realize greater per period benefits from formality and they expect to reap those benefits over a longer period.

Similarly, there is a positive relationship between firm age and participation. Older firms have greater expected lifetimes because the increasingly precise estimate of their costs makes it less and less likely that they will fail as time goes on. Consequently, older firms are also larger on average. However, the positive relationship between age and participation is not an artifact of larger size alone. Conditional on size, older firms have longer expected lifetimes[15] and thus greater potential for realizing the benefits of participation. So both firm size and age are

[15] Their more precise cost estimates mean they are less likely to realize unexpectedly bad profits that would cause them to reach the failure bound.

positively correlated with participation: among the youngest firms, only the largest choose to become formal; over time they are joined by smaller firms.

To summarize the predictions of our framework:

1. *There is heterogeneity in the degree of formality.* The benefits and costs of participation undoubtedly vary across societal institutions, and vary for firms of different size and expected lifetime. While there are potential complementarities between different societal institutions, a large number of firms will choose to participate in only a subset of institutions at any point in time. For example, the legal system and bank financing are complements, but a firm may have to register legally before seeking external financing. Thus informality is not an all-or-nothing state and the degree varies by firm. This is not addressed by the other theoretical approaches -- including models of regulatory and tax compliance that typically consider only one dimension of participation -- but it accords with Tokman's observations (1992).

2a. *Small firms are disproportionately informal.* They benefit least from participation because of the small scope of their dealings with the public and hired employees (relative to the total volume of transactions undertaken by the firm). This has the corollary that:

2b. *"Inefficient" firms are disproportionately informal.* This implication is in line with many characterizations of the informal sector (Thomas, 1992; Portes, 1994). However, in contrast to other formulations, in this case the causality is not necessarily from informality to inefficiency. High θ -- *i.e.* high cost -- firms choose less formality because it benefits them less than more efficient firms that produce at higher volumes for longer lengths of time.

2c. *Young firms are disproportionately informal.* This is partly because young firms are more likely to be small. Conditional on size, the population of young firms contains a disproportionate number that have not received enough signals to figure out whether paying the costs of formality are worthwhile; many eventually will go out of business.

3. *Mode of operation (type of work site) and formality are jointly determined.* Small firms range in mode of operation from ambulatory hawkers to more settled establishments. One dimension of mode of operation, work site permanence, is not addressed by the other theoretical models. However, a number of ad hoc characterizations -- most notably de Soto's (1989) -- draw a strong link with informality: informal firms operate out of temporary/makeshift buildings or

stalls, or even door-to-door. Firm expansion involving greater capital outlays, K, requires greater permanent work sites and, simultaneously, greater formality to establish property rights or formalize contracts.[16]

As a second example, firms of different sizes (at different stages of growth) may have different degrees of interaction with the public. Because implicit contracts over product quality are cheaper and feasible to enforce with friends and family, the entrepreneur may find it most cost effective to primarily serve such customers when faced with small sales volumes. At larger volumes (later in the firm's life cycle), friends and family cannot necessarily buy all the firm's output, so sales to the general public and other firms should increase.

4a. *Underlying patterns of firm dynamics should be comparable in both developing and industrialized countries.* If the distribution of entrepreneurial ability and the learning process are similar across countries, then so should be the patterns of firm entry and exit. This also implies similar firm age distributions and overall firm dynamics (assuming comparable economic environments).

4b. *Informal sector firms have relatively high mortality rates.* The high turnover rate of informal firms that might appear as evidence of the inferiority of informal employment reflects the high mortality among small firms observed everywhere. The high turnover rate of such firms and jobs is not necessarily related to being informal *per se*. Although many informal firms will be small mature firms with high costs (but not so high that they eventually go out of business), many will be the "false starters" with imprecise estimates of their profitability that eventually fail.

5. *Firms participate in an increasing number of societal institutions as they grow.* As firms with a low θ grow to their equilibrium size, the depth of participation -- measured by the fraction of all institutions in which the firm participates or by the degree of participation with each individual institution -- increases as well.

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[16] Our assumption that the government can perfectly exclude firms that do not voluntarily pay the full costs of participation undoubtedly is too restrictive. Hence larger businesses that have more permanent work sites are easier for the government to detect. So participation -- as measured by tax compliance and public registry -- will be greater for such firms.

The implications for standard models of tax evasion and regulatory compliance are straightforward. Traditional approaches assume that enforcement agencies try to maximize social benefit (minimize social harm) subject to a binding budget constraint. Both these approaches and ours predict that large firms (the biggest violators on a per unit output basis) are more likely to participate. The difference between approaches lies in the determinants of compliance: traditional approaches assume that enforcement solely determines compliance; we model the (relative) net benefit to the firm. The actual importance of gross benefits versus gross (penalty) costs is an empirical matter, one that, unfortunately, we cannot test with our data. However, our approach shows that both costs and benefits to the firm should be accounted for when attempting to identify the importance of enforcement efforts.

Moreover, our approach indicates that the *duration* of an economic activity should be considered when modeling participation. Traditional approaches to tax evasion and regulatory compliance typically ignore this issue, in part because they consider long-lived economic agents; in particular, firms are viewed as infinitely long-lived. However, we have shown that if firm dynamics play an important role in the economy -- as they appear to do -- then they should be factored into participation considerations.

III. Empirical results

1992 National Micro Enterprises Survey (ENAMIN) from Mexico, offers the first comprehensive survey to date on compliance with or participation in several distinct markers of formality including registration with the tax authorities, tax payment, labor protection, participation in guilds or trade associations, and enumeration in the census, as well as other relevant characteristics. It thus, permits us to generate a reliable picture of the nature of informality, as well as to test the consistency of our framework with reality. The sample was generated by selecting approximately 11,000 individuals from the 1991:4 National Urban Employment Survey who declared that they were self-employed or heads of firms of five workers or fewer (fifteen or fewer in manufacturing). They were reinterviewed in the next quarter to generate a more detailed accounting of income, capital stock, costs, employment patterns, and a variety of details related to participation in societal institutions. Of the sample of individuals

reinterviewed in early 1992, a total of 9,036 were still operating businesses.

Our empirical approach is to seek patterns of participation that accord with the predictions detailed in the previous section. However it should be emphasized (again) that there is a fundamental identification problem faced *both* by our methodological approach and by other approaches that assume enforcement efforts are the sole determinants of participation. We are aware of no data set with the requisite information on both costs and benefits of participation to evaluate the relative importance of each approach.[17] Our limited goal in this section is to document empirically the heterogeneity and depth of participation; show the importance of firm size, age, and mode of production as correlates of participation; and (partially) establish a role for firm dynamics and life cycle considerations as key concerns for modeling participation (in both developing and industrialized countries).

1. Heterogeneity of Participation

Though the data set is bounded above at five workers (fifteen in manufacturing), even within this narrow firm size range informality is clearly not an all or nothing proposition. The summary statistics in Table 1 show that there are high participation rates in societal institutions for even these small firms: 41.7 percent are registered with the federal treasury, 25.2 percent are registered with the local treasury (including Mexico City), 34.6 percent pay some taxes to one or both treasuries, 34.6 percent of firms with paid workers have them registered with IMSS (Mexico's social security administration), 22.5 percent are members of a business guild or association, 15.6 percent pay dues to a business organization, and 33.1 percent of firms that existed in 1989 were enumerated in the Census of that year.

Table 2 presents cross tabulations along several dimensions of participation and shows that participation along one dimension need not imply participation along others. For example,

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[17] Such a data set would have to identify exogenous variation in government policy that is independent of firms' decisions over formality. This identification is extremely difficult in practice because most policies are implemented nationwide, confounding the effect of policy changes with business cycle and macroeconomic forces that also influence firm behavior. A differences-in-differences approach that utilized between state (or province or region) variation in policies would work in principle. But the existence of multi-establishment firms that cross state lines would make assignment into the proper treatment groups problematic.

the bottom left panel contains all the firms that have paid workers and are greater than three years old, which means that they should be registered with the federal treasury, should have their (paid) workers registered with IMSS, and should have been enumerated in the Census. However, of this group only 72.9 percent are registered with the federal treasury, 63.8 percent pay taxes, 31.8 percent participated in the Census but not IMSS, while 7.2 percent participate in IMSS but not the Census.

Clearly, participation is a question of degree and spans many dimensions. This suggests that previous research that lumped together all small firms as representing the informal sector (*e.g.* Rauch, 1991) obscured important differences among them. In the interest of avoiding some of the conceptual confusion that surrounds the topic, it may therefore be preferable that future analysis employ the term "informal" to exclusively refer to the issues of participation discussed here. This would leave considerations of firm size, wages/productivity, labor market segmentation, *etc.* to be addressed under labels that correspond more precisely to the phenomena being studied. [18] More generally, our evidence indicates that models of regulatory and tax compliance may need to consider possible complementarities between different institutions when modeling participation and enforcement for individual institutions.

2. Distribution of Formality Across Firm Characteristics

Points 2a-2c above argue that participation decreases with θ and increases with the probability of long run success. Although we cannot observe either, the framework shows that they are monotonically related, respectively, to firm revenue/size and to firm age (conditional on size). This leads to the following empirical specification:

$$\Pr(\text{Participation}) = \beta_0 Constant + \beta_1 Revenue + \beta_2 Age + \varepsilon \qquad (4)$$

where revenue is total firm revenue, age is the number of years the firm has been in business (or

[18] This is consistent with many characterizations of the informal sector (Thomas, 1992; Portes, 1994). Strictly speaking, in our framework firms choose between different institutional arrangements (Lin and Nugent, 1995). Informality encompasses a set of institutional arrangements including enforcement of contracts through social networks and self-insurance against employee health problems. Formality encompasses a different, complementary set of institutional arrangements including compliance with government reporting requirements. See also Peattie (1987) who critiques usage of the term "informal sector."

the number of years the current proprietor has been operating it), and ε is an idiosyncratic error term. We measure the probability of participation a number of different ways: (a) as an indicator variable for any participation in an individual institution, (b) as the degree of participation within a particular institution, and (c) as the degree of participation among a range of potential institutions. In each case the null hypothesis is that: (a) $\beta_1>0$, (b) $\beta_2>0$, that is participation should be an increasing function of both firm size and firm age.

Table 3 shows the rate of registration with the federal treasury, the rate of registration of firms' paid workers with the social security administration (IMSS), and the rate of enumeration in the 1989 Census by firm size and by firm age. As predicted, there is a very strong positive relationship between participation and firm size/revenue. The relationship between participation and firm age is also positive, though much weaker. Table 4 reports the results from fitting probit regressions for the seven different types of institutions. In each case the coefficients on both firm size and age are positive and significant at better than the 1 percent level of confidence. (The standard errors were corrected for arbitrary forms of heteroskedasticity.) The estimated changes in the probability of participation for a unit change in each regressor are reported in Table 4.A. The relationship between size and participation is very strong: each point increase in log revenue corresponds to, for example, a 20 percent greater rate of tax compliance, a 23 percent greater rate of social security compliance, and an 11 percent greater rate of business guild registration.[19] The relationship between age and participation is more marginally significant: a ten year difference in age increases participation in the various institutions by 2 to 4 percent.[20]

One potential concern is that the benefits of participation undoubtedly vary by industry. Given systematic differences in average firm size and age across industry, the positive relationships between size and participation and between age and participation in Table 4 may be spurious. To test this we tried alternate specifications (not reported), both including industry

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[19] Log revenue was used to avoid giving undue weight to the small number of firms with extremely high levels of revenue.

[20] As a specification check, we tried substituting the two sets of dummy variables for the revenue and age classes (from Table 2) for the linear terms. The results were qualitatively the same both in these and the subsequent regressions.

dummies and running separate regressions by industry. The results including industry dummies were virtually identical to those in Table 4. The industry-specific regressions, despite the markedly reduced degrees of freedom, also yielded comparable results.

3. Mode of operation.

Table 5 reports the results from fitting equation (4) to two other measures of formality that capture the nature of the production process jointly determined with the level of formality: the permanence of the firm's work site and whether individuals and families are the firm's only main customers. Permanent work site is a dummy variable equal to one for those firms that operate out of a fixed site in a public marketplace, a factory, a variety/grocery store, or a retail service establishment.[21] Changes in probabilities are reported in Table 5.A. As expected, firm size and age are positively (and significantly) related to work site permanence: older firms and those producing at larger volumes require more permanent work sites.

The indicator for firms whose only main customers are individuals and families potentially is an inverse measure of formality. The ideal measure would include only close friends and family of the proprietor. The survey's measure is more broad but may still provide evidence in favor of our framework, so long as the measure is most accurate for smaller firms. Smaller firms should market more exclusively to close acquaintances because larger volumes of production require firms to seek customers among the general public. The measure may be negatively related to firm age for the same reason

The second row of Table 5 shows that, as predicted, firm size is negatively related to whether the firm sells primarily to only individuals and families. However, the relationship with firm age is positive. To investigate the source of that positive relationship, the bottom row of the table reports the same regression including industry dummies. The results show that the positive

[21] Only those firms operating out of temporary work sites that might serve as launching pads for more permanent work sites, and those firms operating out of permanent work sites that could have transitioned from a less permanent work site, were included in the regression. Excluded firms included those operating out of unspecified non-permanent or permanent work sites. In addition, those whose business is the transportation of people or merchandise, and hotels/taverns/inns/hostels were not included in the regression. Specifications that, in turn, (a) included these firms, and (b) limited the definition more narrowly, yielded comparable results.

relationship disappears when industry dummies are included, indicating a spurious effect in the previous regression. However, the strong negative relationship with firm size persists, providing evidence in favor of our framework. Separate regressions by industry (not reported) yielded similar results.

4. *Firm dynamics*

To fully test the dynamics of our framework would require longitudinal data. Though the ENAMIN is the most comprehensive data source available to date, it lacks this dimension. Nonetheless, the cross sectional evidence it does offer is consistent with our framework. First, though the data is truncated at a firm size of five employees (fifteen in manufacturing), long lived firms exist across the revenue distribution, reflecting the underlying distribution of θ. Remarkably, average firm age is roughly the same across all deciles of the revenue distribution, ranging from a low of 7.9 years for the seventh decile to a high of 9.0 years for the second decile; the first and last deciles have respective means of 8.8 and 8.7 years.[22] Moreover, the relatively uniform revenue-age distribution is not an artifact of the upper limit on number of employees: average firm revenue in the last revenue decile is more than eighty times larger than the first revenue decile. This suggests that this population of firms may be in a steady state, with entry and exit rates roughly uniform across the revenue distribution.[23]

Second, the observed patterns of firm entry and exit are consistent with those predicted by our framework and with those observed in the U.S. and in other developing countries. Numerous studies have documented high entry and failure rates among startups that decline with size and age of the firm.[24] Evans and Leighton's (1989) study of self-employment dynamics in

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[22] The difference in average firm age between the second and seventh deciles is statistically significant at a five percent level of confidence. The difference between the first and last deciles is not.

[23] Note that "exit" could happen for two reasons. The upper size limit on number of employees means that firms would leave the sample frame either if they failed or if they added too many employees. Smaller firms undoubtedly are more likely to fail; whereas larger firms are more likely to grow their way out of the sample frame.

[24] Mansfield (1962) shows that smaller firms have higher and more variable growth rates. Dunne, *et al.* (1989) demonstrate that U.S. manufacturing plant failure rates decline steadily with the age of the plant. Davis, *et al.* (1994) find that net job creation in small U.S. manufacturing firms is not high relative to large businesses, despite

the U.S. provides the most comparable benchmark for our analysis. They find that inflows into self-employment over the previous year account for about 20 percent of self-employment for men over 35, with an even greater proportion for younger men. This is consistent with a constant rate of entry and older men running more established firms that are less likely to fail. Evans and Leighton also document a sharply decreasing exit rate from self-employment for the U.S., with the probability of failure ranging from 15 percent for the oldest of the self-employed to over 50 percent for the youngest of the self-employed.

The overall patterns of firm age by age of the owner for Mexico in Table 6 are comparable. The last two sets of columns in Table 6 show the fraction and number of firms at each age range that are no more than one year and two years old, respectively. Consistent with Evans and Leighton's estimates, the number of entries is relatively flat throughout the life cycle. Yet the fraction of the self employed comprised of new entrants declines steadily, commensurate with a sharp increase in average firm age. Together, these patterns suggest that declining exit rates are probably partially responsible for the sharp increase in average firm age in these data.[25] These broad similarities in self-employment dynamics between Mexico and the U.S. suggest that common determinants of self-employment may be as important as differing institutional factors in explaining the observed patterns of participation.

5. Depth of participation

Our approach predicts that firms participate in an increasing number of institutions as they grow. Again, because the ENAMIN lacks a longitudinal dimension, we cannot directly test the time series implications. However, the cross sectional implications are supported by the data.

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inordinately high rates of gross job creation, because of their disproportionately high rates of job destruction. Roberts and Tybout (forthcoming) find that in Mexico, Colombia and Morocco business births and failures are even more frequent and numerous in those countries than in the U.S., accounting for much larger shares of total employment adjustment. New plants are much smaller and less productive than the industry average and the failure rate is highest at young ages.

[25] Evans and Leighton do not report average firm age by age of the owner, making direct comparison with the numbers in Table 6 difficult. However, if we assume that the exit probabilities in their data apply disproportionately to the very young firms within each age cohort, a likely phenomenon given the learning process, then average firm age must rise with age of the owner, as in Table 6.

The depth of participation -- as measured by degree of compliance -- is analyzed in Table 7. Two measures are used: the fraction of the firm's paid workers registered with IMSS (for the subset of firms with any paid workers), and the fraction of all institutions in which the firm participates. Both variables are bounded below by zero and above by one, so the estimation used double-censored tobits.[26] The second and third rows of the table report two different specifications for the fraction of all institutions in which the firm participates. The first encompasses all seven institutions in Table 4. The second excludes business guild registration and dues payment because not all firms may have access to such institutions; *i.e.* differences between firms in participation along this dimension may simply represent cross-industry differences in production technology or market structure.

The patterns in Table 7 again are consistent with our prediction that the depth of participation is an increasing function of both firm size and age. Excluding business guild registration and dues payment in the third row makes these relationships stronger. The inclusion of industry dummies (not reported) leaves the results largely unchanged.

IV. Relation to Previous Informal Sector Research

The framework offered here departs from the premise that the small scale firms found in developing countries are fundamentally different from those in industrialized countries. Thus, it is solidly in the spirit of Hart (1972) and de Soto who stressed the intrinsic dynamism of the sector. In conceiving of formality as an input into the production function and that firms choose the optimal level along a continuum, we provide a theoretical underpinning both for Tokman's grey areas of partial compliance, and for de Soto's view that a lack of access to institutions is a binding constraint on firm growth.

De Soto claimed that onerous compliance costs prevent firms from becoming formal. This concern was echoed by Porter (1995) who cited high and uncertain regulatory costs as barriers to firm growth in United States inner cities. Both of these perspectives are easily nested in our framework as a case where the government sets p_0 so high that for most firms the

[26] Ordinary least squares regressions yielded comparable results.

discounted net present value of participation never exceeds its costs. But our model also implies that it may never be possible to induce all firms to participate simply by streamlining compliance procedures: for many very small firms, the benefits of participation may not exceed even modest costs.[27]

By relaxing our stylized view of the well functioning "market" for formality, we can encompass both Rauch's and Loayza's views. Clearly, reality is more complex than our extreme assumption that firms get only the participation they pay for and pay for none they do not want. Many institutions of civic society are public goods and the government imposes universal fiscal levies, making tax evasion attractive. Moreover, an enforcement agency seeking to maximize social benefit could easily choose to focus its efforts on longstanding, large firms, leaving the door open for small, low productivity firms to avoid taxation and regulation. Rauch, in fact, *defines* the informal sector as those firms of a size below which the government chooses not to enforce minimum wages. Incorporating this into our perspective, a growing firm may willingly choose to comply with such size-based regulations in order to get unimpeded access to necessary institutions.[28]

The logic behind Esfahani and Salehi-Isfahani's model (1989) is also consistent with the view presented here. Larger firms use more complex production technologies as they grow, making worker monitoring more difficult. They thus voluntarily pay efficiency wages that, in practice, may include health care or other benefits, to reduce shirking. Again, more efficient firms would become increasingly formal as they grow. But formality of the firm is an independent consideration from the wages it pays its workers: a small, longstanding firm that does not pay efficiency wages likely would participate in formal institutions such as the legal and banking systems.[29]

Finally, there is nothing in the static nature of previous models that makes them

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[27] See Ozorio de Almeida, *et al.* (1994) for a discussion of deregulating the informal sector.

[28] In this example, the cost of complying with the minimum wage is part of p_0 and p_t.

[29] Both Schaffner (1996) and Velenchik (1996) have documented a positive firm-size wage effect for Peru and Zimbabwe. Such an effect is a critical component of Esfahani and Salehi-Isfahani's efficiency wage model. However, both of the former authors argue that such evidence is *not* supportive of that class of model.

inconsistent with the approach described here. For instance, both Rauch and Loayza require an exogenous change in government policy to induce transitions between the formal and informal sectors. But this arises purely because they were not concerned with modeling firm dynamics. Within the context of our approach, such a policy change is equivalent to altering p_0 and/or p_t, which leads to comparable comparative static results as those described in both Rauch and Loayza.

Conclusion

Using a unique data set from Mexico, we have provided a more detailed characterization of the nature of informal production than previously possible. Beyond the empirical regularities, we also have offered a new approach to analyzing the informal sector. This approach assumes that informal firms in developing countries behave similarly to those in the industrialized countries, and is based on a model of firm dynamics frequently used in the industrial organization literature. It offers an alternative motivation for informality which, unlike much of the literature on tax evasion and regulatory compliance, asserts that participation in societal institutions may be essential to growth, and therefore at least partially voluntary. It also can nest many existing models that base existence of the informal sector solely on institutional distortions, market failures, or excessive government regulation. Though the data do not permit a definitive test of competing models, they are consistent with the predictions of our approach. This suggests that our framework is an important benchmark to be considered when analyzing the informal sector and regulatory compliance.

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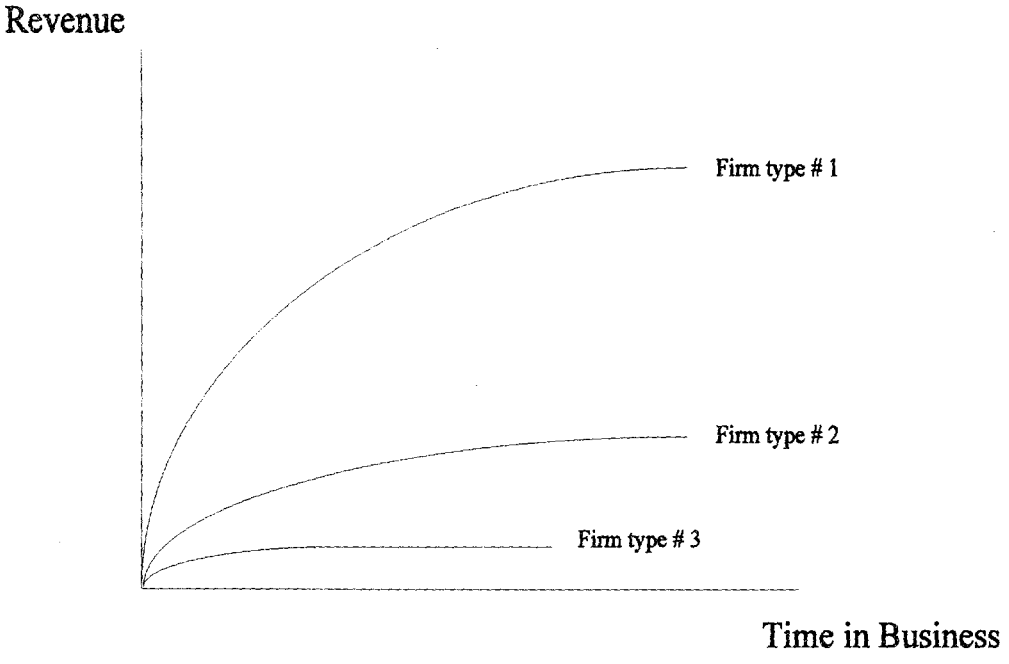

Figure 1

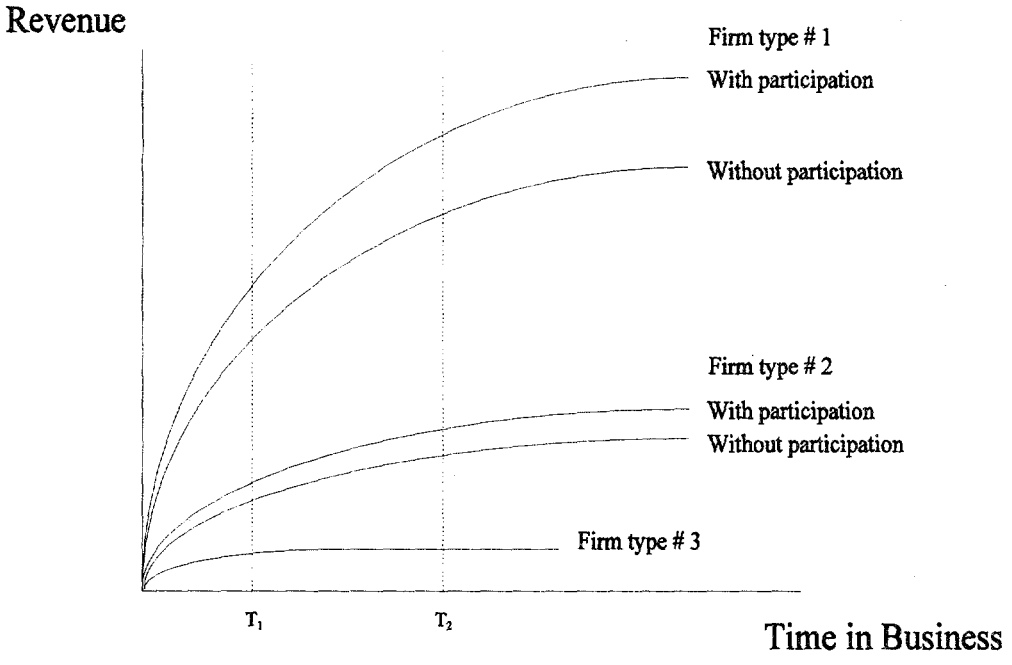
Revenue
Firm type # 1
With participation
Without participation
Firm type # 2
With participation
Without participation
Firm type # 3
T1
T2
Time in Business

Figure 2

Table 1: Summary statistics

Variable	Mean	S.D.	Min	Max	N
Total Revenue	3668	8145	2	200000	8873
Log(total revenue)	7.42	1.19	.693	12.2	8873
Net Income	1260	3138	-78498	126300	8807
Years in Business	8.58	9.37	.167	51	9033
Number of paid workers	.384	1.08	0.00	15	9036
Any paid workers	.193	.395	0.00	1	9036
Number of unpaid workers	.232	.601	0.00	5	9036
Any unpaid workers	.164	.370	0.00	1	9036
Registered with federal treasury	.417	.493	0.00	1	9036
Registered with local treasury	.252	.434	0.00	1	9036
Amount of taxes paid	78.5	552	0.00	30000	8401
Paid any taxes	.346	.476	0.00	1	9036
Any paid workers registered with IMSS	.346	.476	0.00	1	1748
Number of paid workers registered with IMSS	.318	.451	0.00	1	1748
Business registered with guild or association	.225	.418	0.00	1	9036
Amount of business organization dues paid	7.04	43.8	0.00	1500	9019
Any business organization dues paid	.156	.363	0.00	1	9036
Enumerated in the 1989 Census	.331	.471	0.00	1	5220
Fraction of all institutions	.279	.301	0.00	1	9036
Fraction of all institutions (excluding guild, dues)	.325	.371	0.00	1	9036
Types of work site:					
Transportation: people or merchandise	.064	.245	0.00	1	9036
Makeshift stand in a public road	.041	.199	0.00	1	9036
Fixed stand in a public road	.017	.130	0.00	1	9036
Makeshift stand inside a marketplace	.023	.149	0.00	1	9036
Fixed stand forming part of a marketplace	.019	.138	0.00	1	9036
Door-to-door or street vendor	.045	.207	0.00	1	9036
Services offered via vehicle or cart	.034	.181	0.00	1	9036
Own home: without specialized equipment	.123	.328	0.00	1	9036
Own home: with specialized equipment	.051	.220	0.00	1	9036
Other non-permanent work site	.008	.088	0.00	1	9036
Fixed work site in a public marketplace	.032	.176	0.00	1	9036
Hotel, tavern, inn or hostel	.0006	.024	0.00	1	9036
Factory: production or repair services	.095	.293	0.00	1	9036
Variety or grocery store	.075	.263	0.00	1	9036
Retail service establishment	.131	.338	0.00	1	9036
Other permanent work site	.008	.091	0.00	1	9036
Home of customer or client	.233	.423	0.00	1	9036
Permanent work site	.485	.500	0.00	1	6194
Family/friends only main customers	.384	.486	0.00	1	9036

Table 2: The Varying Degrees of Formality
Incidence of Registration with Federal Treasury and Payment of Taxes by Various Firm Characteristics

	All firms				Firms registered with local treasury				Firms registered with business guild or organization				
	# firms in this group	% firms in this group	% regis with fed treasury	% pay taxes	# firms	% firms	% fed treas	% pay taxes	# firms	% firms	% fed treas	% pay taxes	% pay guild/ org dues
1. All firms	9036	100.0	41.7	34.6	2273	100.0	78.8	74.0	2035	100.0	67.7	54.0	61.4
2. Paid workers>0	1748	100.0	73.1	61.3	690	100.0	91.6	79.6	573	100.0	88.0	72.1	57.4
2.A. and IMSS=0	1144	65.4	61.5	50.9	396	57.4	87.1	74.7	282	49.2	97.9	82.5	58.8
2.B. and IMSS>0	604	34.6	95.0	81.1	294	42.6	97.6	86.1	291	50.8	77.7	61.3	56.0
3. In business>3 years	5220	100.0	42.8	37.1	1365	100.0	79.1	76.3	1284	100.0	68.8	56.9	62.6
3.A. not in 1989 Census	3493	66.9	20.1	18.5	482	35.3	55.6	63.3	637	49.6	46.3	37.4	64.2
3.B. and in 1989 Census	1727	33.1	88.8	74.8	883	64.7	92.0	83.4	647	50.4	91.0	76.0	61.1
4. Pd wkrs>0, >3 years	1096	100.0	72.9	63.8	440	100.0	92.7	82.7	378	100.0	89.2	75.1	58.7
4.A. IMSS no, Census no	348	31.8	31.0	28.4	68	15.5	77.9	75.0	62	16.4	61.3	48.4	62.9
4.B. IMSS yes, Census no	79	7.20	86.1	74.7	26	5.91	100	80.8	34	8.99	97.1	73.5	50.0
4.C. IMSS no, Census yes	337	30.7	88.4	77.2	168	38.2	92.9	81.0	110	29.1	88.2	76.4	54.5
4.D. IMSS yes, Census yes	332	30.3	97.9	84.6	178	40.5	97.2	87.6	172	45.5	98.3	84.3	61.6

Only those firms in business for more than three years could have been enumerated in the 1989 Census of businesses. IMSS refers to registration of the firm's paid workers with the Mexican Social Security administration. Only paid workers have to be registered with IMSS.

Table 3: Summary Statistics
The Relationship between Formality and Firm Size and Age

	Registered with federal treasury		Any workers registered with IMSS		Enumerated in 1989 Census	
Revenue decile	**Mean**	**Obs**	**Mean**	**Obs**	**Mean**	**Obs**
1st decile	.080	889	0	6	.087	472
2nd decile	.125	910	0	11	.109	512
3rd decile	.184	917	0	19	.136	523
4th decile	.257	1197	.024	84	.196	730
5th decile	.401	558	.075	67	.299	341
6th decile	.444	1024	.102	167	.317	590
7th decile	.581	816	.219	206	.444	441
8th decile	.600	788	.279	219	.442	443
9th decile	.710	909	.331	381	.547	537
10th decile	.855	865	.606	538	.751	535

	Registered with federal treasury		Any workers registered with IMSS		Enumerated in 1989 Census	
Years in business	**Mean**	**Obs**	**Mean**	**Obs**	**Mean**	**Obs**
less than one year	.323	876	.237	131	0	0
1 year	.374	838	.221	131	0	0
2 years	.416	1094	.343	181	0	0
3 years	.455	857	.345	171	0	0
4 years	.463	559	.391	110	.309	537
5 years	.432	562	.336	125	.309	538
6 to 7 years	.411	672	.397	156	.316	648
8 to 9 years	.401	504	.290	100	.287	492
10 to 12 years	.441	975	.415	193	.312	952
13 to 15 years	.416	551	.418	122	.353	541
16 to 19 years	.467	304	.333	69	.391	297
20 to 29 years	.438	765	.321	159	.359	744
30 years or more	.435	476	.414	99	.376	468

Table 4. Participation in societal institutions

Dependent variable	Log revenue	Years in business	Pseudo R^2	# obs
Registered with federal treasury	.661 (37.7)	.006 (3.95)	0.200	8870
Registered with local treasury	.371 (26.9)	.006 (3.57)	0.083	8870
Pays any taxes	.556 (35.6)	.008 (5.35)	0.158	8870
Any paid workers registered with IMSS	.634 (17.2)	.010 (2.95)	0.161	1697
Enumerated in 1989 census	.538 (26.5)	.013 (6.26)	0.154	5121
Registered with business guild/organization	.383 (26.8)	.006 (3.87)	0.090	8870
Pays any dues	.312 (21.6)	.007 (4.02)	0.066	8870

Probit regressions. Absolute values of *z* statistics in parentheses. The standard errors have been corrected for arbitrary forms of heteroskedasticity.

Table 4.A. Participation in societal institutions
(difference in probabilities from a one unit change in the regressor)

Dependent variable	Log revenue	Years in business
Registered with federal treasury	.254	.002
Registered with local treasury	.113	.002
Pays any taxes	.199	.003
Any paid workers registered with IMSS	.226	.004
Enumerated in 1989 census	.188	.004
Registered with business guild/organization	.108	.002
Pays any dues	.070	.002

Table 5. Other measures of formality

Dependent variable	Log revenue	Years in business	Pseudo R^2	# obs
Permanence of work site	.538 (31.3)	.009 (4.97)	0.162	6066
Families/individuals only main clients	-.277 (22.9)	.007 (4.63)	0.048	8870
Families/individuals only main clients (adding industry dummies)	-.208 (15.1)	-.001 (0.63)	0.176	8868

Probit regressions. Absolute values of *z* statistics in parentheses. The standard errors have been corrected for arbitrary forms of heteroskedasticity.

Table 5.A. Other measures of formality
(difference in probabilities from a one unit change in the regressor)

Dependent variable	Log revenue	Years in business
Permanence of work site	.214	.004
Families/individuals only main clients	-.105	.003
Families/individuals only main clients (adding industry dummies)	-.078	-.0004

Table 6: Distribution of Firm Age by Age of the Owner

	Years in Business	Years in Business: One year or less		Years in Business: Two years or less	
Age of Owner	**Mean**	**Mean**	**Frequency**	**Mean**	**Frequency**
19 or younger	2.61	.524	99	.693	131
20 to 24	2.86	.366	191	.573	299
25 to 29	3.96	.277	253	.462	421
30 to 34	4.96	.233	268	.380	437
35 to 39	6.41	.193	250	.325	420
40 to 44	7.90	.168	196	.283	329
45 to 49	9.53	.138	138	.251	251
50 to 54	11.5	.128	117	.191	174
55 to 59	12.8	.116	75	.199	129
60 to 69	15.8	.107	91	.180	153
70 or older	17.8	.086	33	.153	59

Table 7. Depth of participation in societal institutions

Dependent variable	**Log revenue**	**Years in business**	**Pseudo R^2**	**# obs**
Fraction of paid workers registered with IMSS	2.84 (9.15)	.051 (2.86)	0.115	1697
Fraction of all institutions in which the firm participates	.245 (52.2)	.004 (7.17)	0.211	8870
Fraction of all institutions, excluding business guild registration and dues	.386 (44.6)	.005 (5.53)	0.145	8870

Tobit regressions. Absolute values of *t* statistics in parentheses.

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